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ABSTRACT

The fourth in a series of reports in a review of materials pertaining to what schools within and outside New York state are doing to save energy. In addition to inhouse memoranda, resource material included letters, studies, and publications received from other local, state, and federal agencies; from private firms and associations; and from the educational news media. As a result of this review, a compilation was made of the types of assistance that are provided in the schools from outside organizations. The first section of this report highlights some of the types of assistance along with selected cross-references to persons who have provided such assistance to local schools. The second section summarizes conservation methods that are in actual use in schools throughout the nation. (Author/MLF)

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ENERGY SAVING PRACTICES IN SCHOOLS

Technical Report No. 4

of

A Study of School Calendars
Conducted for the Board of Regents
of the State of New York

by

The Division of Research

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The University of the State of New York
THE STATE EDUCATION DEPARTMENT
Albany, New York 12234
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Mr. Jack Conway, consultant, was assigned the difficult task of welding together information which had accummulated in the file that dealt with energy saving in the schools. These bits and pieces had come from various sources, and were not directly connected to any of the technical studies. Still the information they contained was too valuable to lose. Jack Conway brought them into sensible order in this study. Gerald H. Wohlferd, Project Operations Manager. William Alwell and Philip Pillsworth, Division of Research, and calendar project staff members reviewed the report.

Carl E. Wedekind, Director
Division of Research

ENERGY SAVING PRACTICES IN THE SCHOOLS

INTRODUCTION

A review of materials pertaining to what schools within and outside New York State are doing to save energy was conducted. Resource material included in-house memoranda; letters, studies, and publications received from other local, state, and federal agencies; from private firms, and associations; and from the educational news media. As a result of this review, a compilation was made of the types of assistance that are provided in the schools from outside organizations. The first section of this report highlights some of the types of assistance along with selected cross-references to persons who have provided such assistance to local schools. The second section summarizes conservation methods that are in actual use in schools throughout the nation. Although the compilations in the second section have been implemented by one or more school districts across the nation, this study has made no evaluation of the actual effectiveness of the practices or the feasibility of their application in New York State. It is strongly recommended that any school district contemplating the use of any of the cited practices contact such agencies as the Education Department's Division of Educational Facilities Planning or hire the professional services of consulting engineers, architects, plumbing contractors, or utility company personnel.

A review of conservation methods was considered to be of significance because one of the calendar options that has been proposed, and in some cases implemented, in order to cope with the high cost and shortages of energy has been the mid-year closing. In cases both in and outside New York State, those schools which did close down during the cold weather of mid-year found that they saved energy. The energy savings were often less than expected, and in many cases, plainly disappointing(3,4,19,20,24). It appeared as though heat emitted from artificial lighting and by the bodies of students and staff accounted for more of a building's heat supply than originally thought. These factors, coupled with the necessity of keeping the buildings in the neighborhood of $50^{\circ}F$ in order to prevent freezing and structural damage, lessened the expected energy conservation impact of the closings. It appeared that the greatest reductions in energy use came as a result of changes in operating methods. As a result of these findings, it has been recommended that, in the event of an energy crisis, the schools remain open and implement conservation methods such as those included in this study. Most of these can be found in the State Education Department's ongoing publication School Facilities Planning and Management News (23), and in citations 11, 12, and 14 in the bibliography.

ORGANIZATIONS WHICH CAN AND DO OFFER ASSISTANCE

State education agencies, other state agencies, and representatives of the private sector, such as the utilities companies, have offered assistance to the schools(14,23). The assistance available has been cross-referenced to the bibliography to give selected out-of-state contacts for further information on some of the activities.

Assistance from State Education Agencies

The most prevalent activity of state education agencies in helping local districts is the publication and distribution of tips and guidelines on energy conservation(2,3,7,11,14,18,23). State education agencies have also provided specific guidelines for energy conservation through better school construction. Some, such as Florida, also monitor energy usage(2). Florida requires local school districts to maintain all energy usage records(2). Energy use accountability is part of the Erie BOCES #1 monitoring system in western New York State(23). As part of the energy conservation efforts of the Colorado Department of Education through Carl Anderson, Director of Energy, state funding above the standard state allotment is authorized, but only to those districts that have an energy conservation plan in effect. The Colorado efforts also include the encouragement of the use of alternative fuel sources. State education agencies also monitor innovative practices. For example, Ralph Askin, state architect for the California Department of Education, monitors solar installations in the schools.

Assistance from Other Agencies Either Alone or in Conjunction with State Education Agencies

The second most prevalent form of external support to the schools is that of holding workshops or conferences for administrators and other school personnel(11,14,23). These have included regional workshops using professionals in heating, lighting, and air conditioning; direct assistance to the local school districts by the school plant maintenance staff of the state education agency; energy education workshops for teachers; workshops for middle and high school students; workshops for custodians; and technical workshops dealing with specific concerns, such as air conditioning, steam heat, and hot water heating. Such workshops in New York State have been organized by the State Education Department's Division of Educational Facilities Planning(23). In addition, encouragement is offered through state awards to local school districts having outstanding programs of energy conservation(14). In Vermont such a program is handled through John Stevens, Science Energy Coordinator, of the State Education Department. West Virginia currently has such a program and, in New York State, monetary awards have been given to districts through means of Title IV-C grants(7,12,17,21). Encouragment of energy conservation is also provided through contests to develop student interest in energy, having school building administrators compete with peers in reducing energy, and identifying model practices and innovative approaches to meeting school energy problems(14). The latter is an expected outcome of the Title IV-C grant administered by Wayne Hughes, Planning Specialist of Erie BOCES #1 in New York State(23).

New York State also renders support to a limited number of districts by entering data into a computer which relates energy use to such factors as building size, building age, number of pupils, and type of heating system(23). Data gathered can be used in support of an energy consumption report, to encourage recordkeeping of fuel use and costs, and to develop an awareness of energy waste(14). Provision is made for printouts to be made available to the schools(14). A comparable statewide service is a goal of the Division of Educational Facilities Planning through use of Educational Facilities Laboratories' program, "Public School Energy Conservation Service"(23). Wisconsin currently has such a program(22).

Local school districts coordinate activities and share information and resources with other state agencies. For example, the New York State Energy Research and Development Authority is developing a comprehensive energy conservation program for New York State(23). North Carolina has such a plan in operation which is the responsibility of Carsie Denning, Director, Division of Plant Operation, North Carolina Department of Education. One type of assistance towards implementing such a plan would be to conduct building audits upon request with a volunteer corps of engineers, utility company representatives, and knowledgeable school personnel(14,23). Such a program is part of the implementation of North Carolina's statewide energy plan as well as Colorado's. The same result could be attained by requiring school districts to designate energy management officers and/or an energy management task force to supervise the use of energy reduction techniques(14). This concept is an integral part of the energy management program of New Mexico's Energy Resources Board(15).

ENERGY CONSERVATION PRACTICES IN SCHOOLS

A wide range of conservation practices are being employed by school districts both in and out of New York State. Those measures depend upon the needs and possibilities unique to each school building. Many districts have developed district-wide conservation policies: outlining strategy, procedures, practices and monitoring techniques(14,16). Chief school officers have taken leadership roles. They have utilized the various talents of mechanical engineers, utility company personnel, heating and plumbing contractors, architects and their own staff in the development of conservation policy(14). In some cases it may be possible to hire contractors or systems design engineers under contracts calling for payment of fees based upon savings resulting from their suggestions(14).

Encouraging Conservation

Certainly, cooperation at all levels is necessary in order to successfully carry out an energy conservation program. Principals can be made responsible for conservation practices in their buildings(14). Staff awareness and cooperation has been fostered through inservice training or tuition reimbursement(11,14). School engineers or local custodians could be required to take training courses without penalty for failure, but with no further advancement without successful completion of the courses(14).

The carrot-on-the-stick technique has been utilized to foster energy conservation in schools by either returning a portion or all money saved to buildings where energy was saved, by rewarding schools that reduce energy use, and by withholding reward from those that did not(8,14). The conduct of an energy conservation week with appropriate study and displays has been used to increase awareness of energy conservation possibilities in the schools and homes for both teachers and students(14).

Simple Energy Conservation Practices

A simple expedient by which energy has been saved is to turn off lights in classrooms when not needed, either because of sunlight, or because the room will not be used(7,8,9,10,11,13). Also classroom and outer doors can be closed, either manually or through removal of automatic stops, to keep heat (or coolness, in the case of air conditioning) in the rooms and school buildings(14).

Evening use of school buildings can be reduced or eliminated by cancelling. restricting or rescheduling community programs held in schools(8,14). Community use of showers can be denied as a further conservation measure.

Certain simple operational procedures have been used to save energy. Furnaces have been cut back earlier in the evening and started later in the morning, pilot lights and water heaters have been turned off in the summer, hot water boosters in kitchens have been turned off when not in use, hot water has been used instead of steam for heating, and swimming pools have been closed during the summer(6,9,13,14,23). Other expedients include reducing the amount of new air brought in for ventilation, changing the kindergarten from 1/2 day sessions every day to whole day sessions every other day, using an energy saving menu occassionally, and closing drapes or shades at night(5,9,10,11,14,23).

Some districts have set back daily temperatures and required children and teachers to wear heavier clothing(9,13,18). Turning down of heat, especially over weekends or winter vacations, has sometimes necessitated the installation of electric heaters in toilets and other vulnerable areas(1). Offices, where personnel work after-hours and during longer turn down periods, have also required electric heating(1). Others with air conditioning have raised the limits before air conditioners come on and changed turn on and turn off times(14). Summer school was also changed to a non-air conditioned school to conserve electricity(14).

Retrofitting

There are numerous retrofitting strategems which have been employed to save energy, many of which involve little capital outlay. These are: caulking, weather stripping, insulating windows; installing storm doors or vestibules; lowering ceilings; insulating roofs; changing from incandescent to flourescent lights; lowering wattage of lights; using economizing shower heads and using timers on showers; and rewiring of time clock controls to allow manual override or variable settings(14,18,23). In some situations windows have been reduced in size or even completely bricked up(14,23).

Repair of malfunctioning equipment is an obvious conservation technique(11,18,23). Upon close inspection, controls have been found to be inoperative, fans running in the wrong direction, wiring improperly done or disconnected from units, boilers and tubes dirty, and burners improperly set(14). In some situations boilers have been found so inefficient they have had to be replaced(14). In other cases heating systems have had to be modified or redesigned(14). One school system found an air conditioner to be cooling the air so much that the air had to be reheated before being blown into the classrooms. Raising the original setting eliminated the need to reheat the air(8).

New Construction

Methods of conserving energy are being incorporated into the design of new school facilities. Included are: insulating glass, vestibules, high efficiency light fixtures, heat recovery systems, heat pumps, recirculation of heat, less glass, solar energy units or roofs designed to accept future installation of solar units(14,23). Consideration is given to alternative fuels, such as coal, sawdust, and industrial wastes(14). Costs of fuels over the years are now being balanced with construction costs(14,23).

Transportation

Busing of pupils has come under critical scrutiny. Changes in routes have been made, parents have been paid 13 or 14 cents per mile to transport their own children, while in other situations parents are charged for transportation within a certain radius from the school(12,14). While one district may now allow the bus driver to take the bus home, if nearer than the school, another may have halted that practice(12). Bus runs have been coordinated with neighboring districts to eliminate duplication, extracurricular activities have been refused transportation, rival sporting schools have been chosen for closeness, larger buses have been purchased, and contracting from private firms have all been used by districts to save energy and money(7,12,14). Also, electronic ignitions and radial tires have been installed on buses to increase gas mileage(12,14).

Other Conservation or Dollar Saving Ideas

A few school districts have their own energy sources available. Drilling and leasing arrangements have been made with petroleum companies for extraction of oil and/or gas under school property, or districts have drilled their own wells(14). Construction and erection of a windmill by students is another method of obtaining cheaper energy(14). School districts have also negotiated cheaper rates directly with the local power supplier or attempted to obtain fuel from other suppliers(14). Suits for more favorable rates have been filed against the public service utility(14). While the latter two measures do not conserve energy, they do save the district money.

Energy Management Systems

Management and auditing of energy usage is an outgrowth of any energy conservation system(14,23). Means of monitoring energy consumption vary from visual checks of lights left on to infrared photography to determine where heat is being lost. Computers have been employed to obtain daily readouts of fuel and electricity consumption, from which comparisons are made to consumption during other days, weeks, months and years(14,22). The computer allows the breakdown of consumption figures by school building, fuel type, and comparisons by degree day. Energy cost figures can be highlighted by listing them as separate items in the budget.

Those districts not using computers, monitor their various meters closely(14). Oil meters have been installed to replace metering by dip stick(14). Utility bills have also received closer attention, with special note of the amounts of energy used rather than costs(14).

Public Awareness

Whatever the energy conservation system used by the schools, the public has been made a partner in the school conservation efforts(14). This not only assures public cooperation, but also alerts the public to energy conservation measures they may use in their own homes. Public awareness has been developed through newspaper releases, seminars, task forces composed of individuals from a wide range of backgrounds, and through working with other agencies. Information disseminated has not always been limited to energy problems and solutions for the local school, but have included the relationship of local energy use with that of the nation and the world(14).

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